

## WHAT IS CLAIMED IS:

1. A thermoplastic polymer comprising a carbonyl-containing group and a nitrogen-containing five-membered heterocycle-containing group in side chains.
2. A thermoplastic polymer comprising an elastomer as a main chain, in which a diene moiety is 5 mol% or less, and a carbonyl-containing group and a nitrogen-containing heterocycle-containing group in side chains, wherein the proportion of side chain moiety is 0.1 to 50 mol% with respect to 100 mol% of the main chain moiety.
3. A thermoplastic polymer comprising an ethylene-propylene copolymer (EPM), an ethylene-butene copolymer (EBM) or an ethylene-propylene-diene copolymer (EPDM) as a main chain, and a carbonyl-containing group and a nitrogen-containing heterocycle-containing group in side chains, wherein the proportion of the side chain moiety is 0.1 to 50 mol% with respect to 100 mol% of the main chain moiety.
4. A thermoplastic polymer comprising a butyl rubber or a halogenated butyl rubber as a main chain, and a carbonyl-containing group and a nitrogen-containing heterocycle-

containing group in side chains, wherein the proportion of the side chain moiety is 0.1 to 50 mol% with respect to 100 mol% of the main chain moiety.

5. The thermoplastic polymer as claimed in claim 2, wherein the nitrogen-containing heterocycle is a five-membered ring or a six-membered ring.

6. The thermoplastic polymer as claimed in claim 3, wherein the nitrogen-containing heterocycle is a five-membered ring or a six-membered ring.

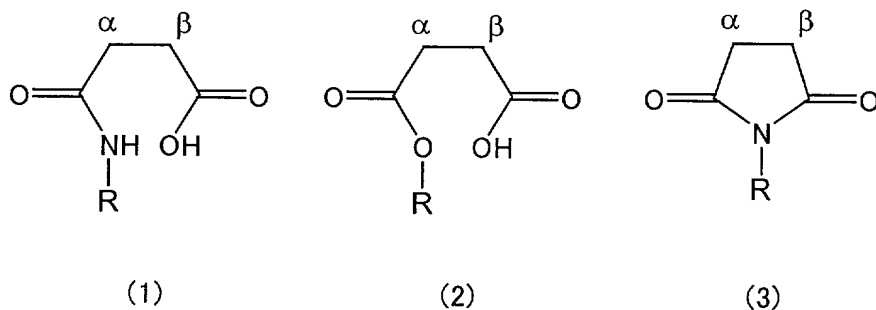
7. The thermoplastic polymer as claimed in claim 4, wherein the nitrogen-containing heterocycle is a five-membered ring or a six-membered ring.

8. The thermoplastic polymer as claimed in claim 1, wherein the carbonyl-containing group is at least one member selected from the group consisting of amide, ester, imide and carboxy groups.

9. The thermoplastic polymer as claimed in claim 2, wherein the carbonyl-containing group is at least one member selected from the group consisting of amide, ester, imide and

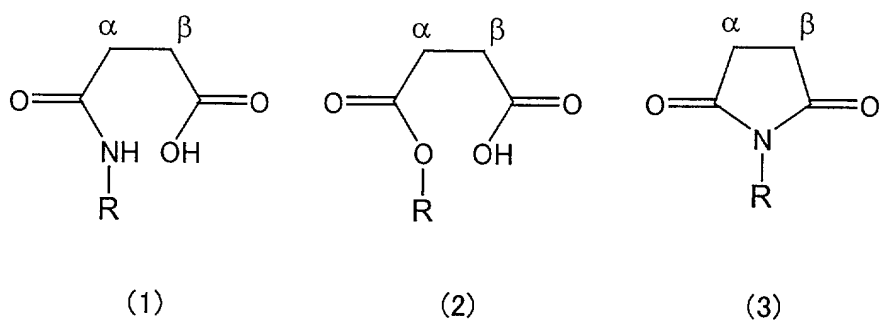
carboxy groups.

10. The thermoplastic polymer as claimed in claim 1, wherein the side chain comprises at least one member selected from the group consisting of the following formulae (1), (2) and (3), which bonds to the main chain at  $\alpha$ -position or  $\beta$ -position.



wherein R represents a nitrogen-containing heterocycle.

11. The thermoplastic polymer as claimed in claim 2, wherein the side chain comprises at least one member selected from the group consisting of the following formulae (1), (2) and (3), which bonds to the main chain at  $\alpha$ -position or  $\beta$ -position.



wherein R represents a nitrogen-containing heterocycle.

12. The thermoplastic polymer as claimed in claim 1, wherein a glass transition temperature ( $T_g$ ) of the thermoplastic polymer is lower than 25°C.

13. The thermoplastic polymer as claimed in claim 2, wherein a glass transition temperature ( $T_g$ ) of the thermoplastic polymer is lower than 25°C.

14. A method for producing the thermoplastic polymer as claimed in claim 1, which comprises reaction of a polymer having a cyclic acid anhydride group in a side chain with a nitrogen-containing heterocyclic compound at a temperature such that the nitrogen-containing heterocyclic compound can react with cyclic acid anhydride group thereby obtaining the thermoplastic polymer.

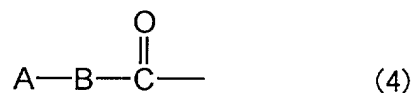
15. A method for producing the thermoplastic polymer as claimed in claim 2, which comprises reaction of a polymer having a cyclic acid anhydride group in a side chain with a nitrogen-containing heterocyclic compound at a temperature such that the nitrogen-containing heterocyclic compound can react with the cyclic acid anhydride group thereby obtaining the thermoplastic polymer.

16. A rubber composition containing the thermoplastic polymer as claimed in claim 1.

17. A rubber composition containing the thermoplastic polymer as claimed in claim 2.

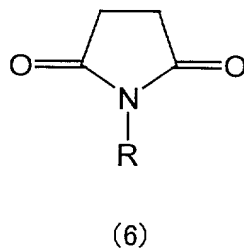
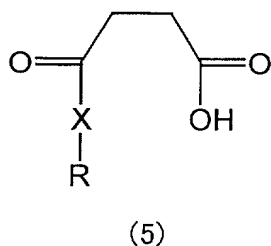
18. A thermoplastic elastomer composition characterized by containing a thermoplastic elastomer having a carbonyl-containing group and a nitrogen-containing n-membered ring-containing group ( $n \geq 3$ ) in side chains, wherein the nitrogen-containing n-membered ring-containing group is bonded to a main chain at 3-position to n-position directly or through an organic group, and a compound of at least one of metal elements selected from the group consisting of Group 2A, Group 3A, Group 4A, Group 5A, Group 6A, Group 7A, Group 8, Group 1B, Group 2B, Group 3B, Group 4B and Group 5B in the Periodic Table.

19. The thermoplastic elastomer composition as claimed in claim 18, wherein the thermoplastic elastomer has a structure represented by the following formula (4) in a side chain.



wherein A represents a nitrogen-containing n-membered ring-containing group bonded to a main chain at 3-position to n-position through an organic group ( $n \geq 3$ ), and B represents an organic group which may contain O, N and S.

20. The thermoplastic elastomer composition as claimed in claim 18, wherein the side chain of the thermoplastic elastomer is represented by the following formula (5) or (6).



wherein R represents a nitrogen-containing n-membered ring-containing group bonded to a main chain at 3-position to n-position through an organic group ( $n \geq 3$ ), and X represents O,

S or NR' wherein R' represents H or an alkyl group having 1 to 10 carbon atoms.

21. The thermoplastic elastomer composition as claimed in claim 18, wherein a compound of the metal element is at least one member selected from the group consisting of  $ZnX_2$ ,  $CoX_2$ ,  $FeX_2$ ,  $FeX_3$ ,  $MnX_2$ ,  $NiX_2$ ,  $CuX_2$ ,  $PbX_2$ ,  $CaX_2$ ,  $BaX_2$ ,  $NaX$ ,  $AlX_3$ ,  $KX$ ,  $MgX_2$ ,  $LiX$ ,  $ZnO$ ,  $CoO$ ,  $FeO$ ,  $Fe_2O_3$ ,  $MnO$ ,  $NiO$ ,  $CuO$  and  $PbO$ , wherein X represents F, Cl, Br, I, OCOR or OH wherein R represents an alkyl group having 1 to 20 carbon atoms.

22. The thermoplastic elastomer composition as claimed in claim 19, wherein a compound of the metal element is at least one member selected from the group consisting of  $ZnX_2$ ,  $CoX_2$ ,  $FeX_2$ ,  $FeX_3$ ,  $MnX_2$ ,  $NiX_2$ ,  $CuX_2$ ,  $PbX_2$ ,  $CaX_2$ ,  $BaX_2$ ,  $NaX$ ,  $AlX_3$ ,  $KX$ ,  $MgX_2$ ,  $LiX$ ,  $ZnO$ ,  $CoO$ ,  $FeO$ ,  $Fe_2O_3$ ,  $MnO$ ,  $NiO$ ,  $CuO$  and  $PbO$ , wherein X represents F, Cl, Br, I, OCOR or OH wherein R represents an alkyl group having 1 to 20 carbon atoms.

23. The thermoplastic elastomer composition as claimed in claim 20, wherein a compound of the metal element is at least one member selected from the group consisting of  $ZnX_2$ ,  $CoX_2$ ,  $FeX_2$ ,  $FeX_3$ ,  $MnX_2$ ,  $NiX_2$ ,  $CuX_2$ ,  $PbX_2$ ,  $CaX_2$ ,  $BaX_2$ ,  $NaX$ ,  $AlX_3$ ,  $KX$ ,  $MgX_2$ ,  $LiX$ ,  $ZnO$ ,  $CoO$ ,  $FeO$ ,  $Fe_2O_3$ ,  $MnO$ ,  $NiO$ ,  $CuO$  and  $PbO$ , wherein X

represents F, Cl, Br, OH, I, OCOR or OH wherein R represents an alkyl group having 1 to 20 carbon atoms.